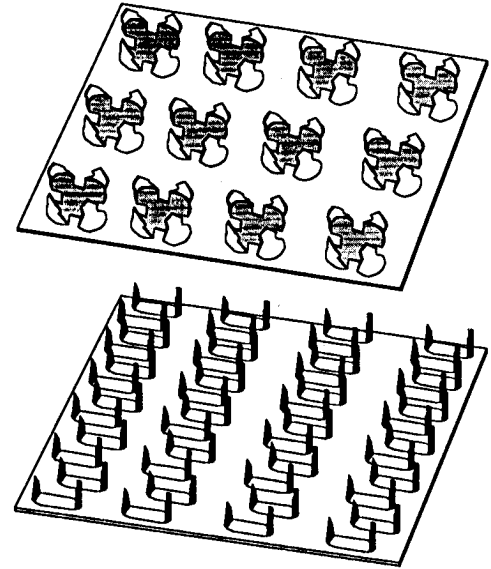


# REPAIRED PALLETS MAY BE STRONGER THAN THE ORIGINAL

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Stringer-style pallets are often notched to permit 4-way entry with forklift tines. Splits often occur around these stringer notches, significantly reducing the strength and durability of the pallet. Pallet stringer repair has traditionally involved replacement of the damaged stringer with a new stringer or support of the damaged stringer with various size companion members. In recent years, the repair of pallet stringers with metal plates similar to those used in the wood truss industry has become more common.



SCHEMATIC DIAGRAM OF TWO OF THE COMMON STYLES OF METAL CONNECTOR PLATES USED TO REPAIR WOOD STRINGERS.

The repair industry recognized the potential benefits of these metal plates for stringer repair, but was also concerned about the potential for ineffective repairs. There was little information on the effectiveness of metal plate repair, minimum guidelines for plate installation, or performance requirements for repaired pallets. The pallet industry had no minimum quality standards for metal used on pallets.

As an initial response, the National Wooden Pallet and Container Association (NWPCA) issued interim guidelines on the use of metal plates in 1991. Additionally Virginia Tech, in cooperation with the NWPCA and the Southeast Forest Experiment Station of the USDA Forest Service, conducted a research program on the use of metal plates for repair of stringer pallets. This study looked at common stringer failure locations splits between the notches, splits above the notches, and splits in the end feet. One of the research objectives was to evaluate the effectiveness of different styles of metal plates to restore the bending strength, stiff-

ness, and impact resistance of broken stringer.

All known pallet metal plate manufactures were asked to submit samples from which 13 plate types were selected for testing. All test plates were 20 gauge. Minimum plate quality was commercial grade steel with a G60 galvanized coating.

#### RESULTS OF BETWEEN NOTCH

##### TESTING

Six plate sizes ranging from a 3"x3" rectangular plate to a 3"x6" that partially supported above the notch were tested for between notch repair of 1½" wide oak stringers. Stringers were broken, repaired with plates, then rebroken as before. In general, all plate types restored stringer strength, but only the 3"x6" restored stringer stiffness. All plate types, however, restored an average of 87% or more of the original stiffness. Thus, if the original stringer deflected ¼", the average plated stringer would deflect only about ½" more. In these laboratory tests of stringers (not whole pallets) we found little significant difference between the six tests of stringers. Other factors such as operator skill, deckboards and nails, plating machinery, and production speed may favor one plate over another.

#### RESULTS OF ABOVE-NOTCH

##### TESTING

Five above-notch plate types were tested, all approximately 2"x6" and rectangular. Notch segments cut from 1½" oak stringers were broken, repaired, then rebroken. On average, none of the plates restored original strength. All but one plate type restored original stiffness. In whole pallets, however, unless a defect is located above the notch, stringers under load usually fail between the notches first. We estimate that these five above-notch test plates restored enough strength so that in whole pallets failures under load will occur between the notches before above-notch plate strength is exceeded. Future tests of whole pallets with above-notch repairs will be required to confirm this theory.

#### RESULTS OF END FOOT TESTING

Two 3"x4" plate types were tested for ability to restore end foot impact resistance to 1½" wide oak stringers. End feet were impacted with multiple forklift impacts until they split, the feet were then repaired and retested. The average foot withstood 3

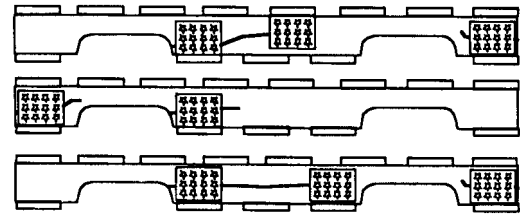
to 5 times more impacts after repair than the original foot. Therefore, repaired end feet maybe stronger than the original, unplated feet.

Many other substudies beyond the scope of this article were conducted in the effects of metal plate stringer repair and reinforcement. These have been summarized in two bulletins distributed by the Pallet and Container Laboratory at Virginia Tech (703)231-7165. Bulletin No. 20 discusses repair, bulletin No. 21 concerns reinforcement.

##### SUMMARY

If properly applied, metal plates can effectively repair certain damages to stringers.

The results of this study have been incorporated into the new "Uniform Voluntary Standards for Wood Pallets," published by NWPCA. This standard includes minimum specifications for the plate and describes proper plate application. To order a copy of the standard, call NWPCA at (703)527-7667.



A SCHEMATIC DIAGRAM SHOWING PROPER PLACEMENT OF METAL (STRINGER) PLATES OVER SPLITS.